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(21) International Application Number: PCT/AU97/00535 (22) International Filing Date: 21 August 1997 (21.08.97) (30) Priority Data: PO 1829 22 August 1996 (22.08.96) AU (71) Applicant (for all designated States except US): COIR PEAT AUST PTY. LTD. [AU/AU]; 114 Somerville Road, Yarrav- ille, VIC 3013 (AU). (72) Inventors; and (75) Inventors/Applicants (for US only): ACKERMAN, Louis [AU/AU]; 114 Somerville Road, Yarraville, VIC 3013 (AU). LOPEZ, George [AU/AU]; 16 Weeks Court, Alexan- dra, VIC 3714 (AU). (74) Agent: CARTER SMITH & BEADLE; Qantas House, 2 Railway Parade, Camberwell, VIC 3124 (AU).	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report.	
(54) Title: ABSORBENT MATERIAL INCLUDING COIR FIBRES AND/OR COIR DUST (57) Abstract <p>A fire retardant absorbent material including coir fibres and/or coir dust, an effective quantity of a fire retardant material in the form of small particles, the particle size of the fire retardant material being of the order of less than 1 micron to ensure that the fire retardant material substantially penetrates or substantially coats at least a substantial proportion of the coir fibres present in the absorbent material.</p>		

ABSORBENT MATERIAL INCLUDING COIR FIBRES AND/OR COIR DUST**Field of the Invention**

This invention relates to absorbent materials.

Background of the Invention

5 The use of coir dust as an absorber of spills of various types has been known for some time, although not widely used. In United States Patent No. 3,703,464, the use of coir dust or coconut short fibres is described as a satisfactory absorbent material for oil spills on water and on other surfaces. The widespread use of this material as a spill absorbent has been restricted to situations where exposure to high
10 levels of heat or fire are not present since coir dust is capable of burning and is therefore regarded as a potential fire hazard.

Summary of Invention and Object

It is the object of the present invention to provide an improved absorbent material which can be used in situations involving high levels of heat or fire.

15 The invention therefore provides an absorbent material including coir fibres and/or coir dust, an effective quantity of a fire retardant material in the form of small particles, the particle size of the fire retardant material being selected to ensure that the fire retardant material substantially penetrates or substantially coats at least a substantial proportion of the coir fibres present in the absorbent material.

20 Preferably, the fire retardant is in the form of a powder, the particle size of which is smaller than the particle size of the coir fibres and/or coir dust to ensure that the fire retardant material substantially penetrates the coir fibres present in the absorbent material.

25 The fire retardant may include a suitable phosphate material, such as ammonium polyphosphate. In its most preferred form, the fire retardant material comprises superphosphate. The inventors have found that superphosphate functions adequately as a fire retardant and that the above defined combination of coir fibres and/or coir dust and superphosphate in the form of a powder results in an absorbent material which is essentially self-extinguishing in the presence of high levels of heat
30 or fire.

It has been found that superphosphate in fine powder form, similar to talcum powder, and preferably having a particle size less than 10 micron, and preferably less than 5 micron, and most preferably of the order of one micron performs satisfactorily in that it adequately penetrates the coconut fibres present in the
5 absorbent material to provide a self-extinguishing property in these fibres.

In a preferred form, the absorbent material includes from about 4 to at least about 8 grams of powdered superphosphate to 115 grams or 1 litre of dry coir dust, together with sufficient water or other suitable liquid to ensure intimate mixing.

In another aspect, the invention provides a method of producing an absorbent
10 material including intimately mixing coir fibres and/or coir dust with an effective quantity of a fire retardant material in the form of small particles, and adding an effective quantity of a liquid such as water to promote intimate mixing of the coir fibres and the fire retardant material whereby the fire retardant penetrates or coats the coir fibres, the particle size of the fire retardant material being selected to
15 ensure that the fire retardant penetrates or coats the coir fibres in the absorbent material.

Preferably, the fire retardant is in the form of a powder, the particle size of which is smaller than the particle size of the coir fibres and/or coir dust to ensure that the fire retardant material substantially penetrates the coir fibres present in the
20 absorbent material.

In a preferred form of the method, powdered superphosphate is used as the fire retardant. It has been found that satisfactory results are achieved by the following mixtures: from about 4 grams to at least about 8 grams of powdered superphosphate to 115 grams or 1 litre of dry coir dust and approximately 65mL
25 water intimately mixed together to ensure penetration of the powdered superphosphate into the coir fibres.

An inspection of the absorbent material according to the above combination shows evidence of small crystals of superphosphate embedded in the walls of the coir fibre nodules. These crystals are believed to contain water of crystallisation
30 which is released when the absorbent material is heated thereby producing the desired self-extinguishing properties.

Description of Preferred Embodiment

Coir dust in the form of compressed bricks 200mm x 100mm x 50mm are reconstituted as coir dust and then intimately mixed with superphosphate and water in the ratio about 115 grams or 1 litre of dry coir dust to about 8 grams
5 superphosphate to about 65mL of water. To ensure proper reconstitution of the bricks and intimate mixing of the resultant coir dust, the coir dust bricks are placed in a rotating hammer mill and a fine mist of water is sprayed onto the bricks as they are converted to the constituent coir dust by the hammer mill. At the same time, superphosphate in the form of a fine powder having a particle size of the
10 order of 1 micron is added to the mill.

A typical analysis of the absorbent product described above is as follows:

	Nitrogen (N) as Protein	0.52%
	Phosphorus (P) as Phosphate	0.57%
	Potassium (K)	0.19%
15	Calcium (Ca)	1.2%
	Sulphur (S) as Sulphate	0.72%
	pH of water extract	5.6

As mentioned above, a microscopic inspection of the coir fibre nodules contained in the coir dust shows evidence of small crystals of superphosphate
20 embedded in the walls of the nodules. These crystals are believed to contain water of crystallisation which is released when the absorbent material is heated thereby aiding in fire retardation.

Acceptable results are achieved using as little as about 4 grams of powdered superphosphate to 115 grams or 1 litre of dry coir dust and about 65mL of water.
25 Better results are achieved using 6 grams of powdered superphosphate and best results are achieved using 8 grams of superphosphate. The use of more than 8 grams of superphosphate does not seem to improve performance to any material extent.

The absorbent material is relatively inert and of low toxicity and is
30 biodegradable. Where the product is used to absorb oil spills, the absorbed oil may

burn if exposed to sufficient heat or flame, but this burning can be controlled by spreading further absorbent product over the fire.

CLAIMS:

1. An absorbent material including coir fibres and/or coir dust, an effective quantity of a fire retardant material in the form of small particles, the particle size of the fire retardant material being selected to ensure that the fire retardant material substantially penetrates or substantially coats at least a substantial proportion of the coir fibres present in the absorbent material.
2. The absorbent material of claim 1, wherein the fire retardant is in the form of a powder, the particle size of which is smaller than the particle size of the coir fibres and/or coir dust to ensure that the fire retardant material substantially penetrates the coir fibres present in the absorbent material.
3. The absorbent material of claim 2, wherein the powder is of a particle size similar to talcum powder.
4. The absorbent material of claim 3, wherein the powder has a particle size of the order of less than 10 micron.
5. The absorbent material of claim 4, wherein the powder has a particle size of the order of less than 5 micron.
6. The absorbent material of claim 5, wherein the powder has a particle size of the order of less than 1 micron to enable adequate penetration of the coconut fibres in the absorbent material.
7. The absorbent material of any one of claims 1 to 6, wherein the fire retardant includes a suitable phosphate material.
8. The absorbent material of claim 7, wherein the phosphate material is an ammonium polyphosphate.
9. The absorbent material of claim 8, wherein the phosphate material is superphosphate.
10. The absorbent material of any preceding claim, including from about 4 to at least about 8 grams of powdered superphosphate to about 115 grams or 1 litre of dry coir dust, together with sufficient water or other suitable liquid to ensure intimate mixing.
11. A method of producing an absorbent material including intimately mixing coir fibres and/or coir dust with an effective quantity of a fire retardant material in

the form of small particles, and adding an effective quantity of a liquid such as water to promote intimate mixing of the coir fibres and the fire retardant material whereby the fire retardant penetrates or coats the coir fibres, the particle size of the fire retardant material being selected to ensure that the fire retardant penetrates or coats the coir fibres in the absorbent material.

12. The method of claim 11, wherein the fire retardant is in the form of a powder, the particle size of which is smaller than the particle size of the coir fibres and/or coir dust to ensure that the fire retardant material substantially penetrates the coir fibres present in the absorbent material.
13. The method of claim 12, wherein the superphosphate is in powder form similar to talcum powder.
14. The method of claim 13, wherein the powder has a particle size of the order of less than 10 micron.
15. The method of claim 14, wherein the powder has a particle size of the order of less than 5 micron.
16. The method of claim 15, wherein the powder has a particle size of the order of less than 1 micron.
17. The method of any one of claims 11 to 16, wherein the fire retardant includes a suitable phosphate material.
18. The method of claim 17, wherein the phosphate material is an ammonium polyphosphate.
19. The method of claim 18, wherein the phosphate material is superphosphate.
20. The method of any one of claims 11 to 20, including from about 4 to at least about 8 grams of powdered superphosphate to 115 grams or 1 litre of dry coir dust, together with sufficient water or other suitable liquid to ensure intimate mixing.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 97/00535

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl⁶: C09K 3/32, B01J 20/22, 20/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C09K 3/32, B01J 20/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DERWENT: (B01J 20/- or C09K 3/32) and COIR: or COCONUT:
JAPIO: as above

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3703464 A (FERM) 21 November 1972 Specification as whole	1-20
A	Derwent accession No. 95-190277/25 class A 84, JP 07-10817 A (SUZUKI SOGYO KK) 25 April 1995	1-20
A	Patent Abstracts of Japan C73 page 165, JP 54-158391 A (OTSUKA KAGAKU YAKUHHN KK) 14 December 1979 Abstract	1-20

☐ Further documents are listed in the continuation of Box C

☐ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Name and mailing address of the ISA/AU
AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION
PO BOX 200
WODEN ACT 2606
AUSTRALIA Facsimile No.: (02) 6285 3929

Authorized officer

L.J. MENZ

Telephone No.: (02) 6283 2431